REMARKS — General

By the above amendment, Applicants have amended the claims to define the invention more particularly and distinctly so as to overcome the technical rejections and define the invention patentably over the prior art.

The Rejection Of The Claims Under § 112

1. In response to paragraph 3, in the last O.A., applicants amended claims 1 and 16 so that the term "a few thousand" has been replaced with "between one and two thousand" in order to render the claim definite.

Therefore, applicants respectfully request reconsideration of the rejection.

The Rejection Of The Claims Under § 103

2. The last O.A. rejected claims 1, 6, 9-11, 16, 20, and 23-25 under 35 U.S.C. 103(a) as being unpatentable over "A Unified Learning Framework for Real Time Face Detection and Classification," Paul Viola, Gregory Shakhnarovich and Baback Moghaddam, (hereinafter Viola) and further in view of Rowe et al., US 7,257,239, (hereinafter Rowe), and "An affine coordinate based algorithm for reprojecting the human face for identification tasks" Kuntal Sengupta and Jun Ohya (hereinafter Sengupta).

Applicants amended the claims as follows:

The Rejection Of Claim 1 on Viola, Rowe, and Sengupta Overcome

3. Applicants respectfully request reconsideration of the rejection for the following reasons:

(1) Novel and unobvious approaches in applicants' system are clearly foreign to Viola, Rowe, and Sengupta. Especially, one of the co-inventors of the present invention, Kuntal Sengupta, is also one of the authors for the prior art, "An affine coordinate based algorithm for reprojecting the human face for identification tasks", and the co-inventor clearly notes that it is unobvious how to derive from the prior art to the present invention.

(2) There is no justification in Viola, Rowe, and Sengupta, or in any other prior art separate from applicants' disclosure, which suggests that these references be combined, much less be combined in the manner proposed. Especially, Viola teaches away from Rowe with regard to a key feature, thus making the proposed combination conflicting and difficult to understand the logical connection.

Novel And Unobvious Approaches In Applicants' System Are Clearly Foreign To Viola, Rowe, and Sengupta

4. Viola, Rowe, and Sengupta do not disclose key ideas in applicants' specification. Especially, one of the co-inventors of the present invention, Kuntal Sengupta, is also one of the authors for the prior art, "An affine coordinate based algorithm for reprojecting the human face for identification tasks", and the co-inventor clearly notes that it is unobvious how to derive from the prior art to the present invention.

The novelty and unobviousness of the invention in claim 1 are based on at least the following 4 points over the prior arts.

(1) Fundamentally, Rowe, and Sengupta lack explicit disclosure of automatic demographics measurement.

Rowe teaches manual input for the entry of user identification data for the first embodiment, using a keyboard, as noted in "user characteristics such as gender and ethnicity are described as being entered using a keyboard" (Rowe, column 10, lines 19-21). Although Rowe noted that other methods could be utilized, such as user input, pre-stored data in the SIM card for a phone, and database of users (Rowe, column 10, lines 22-34), and Rowe also superficially noted "any entry of data indicating for example gender or ethnicity might be avoided. This could be achieved by the model generation computer 3 processing a received image to identify the gender or ethnicity etc of an individual pictured" (Rowe, column 10, lines 35-39), Rowe does not explicitly teach a specific idea of automatic demographic classification as the present invention does.

Sengupta is entirely foreign to the automatic demographics measurement.

Whereas, as one of the key steps in the present invention, applicants explicitly teach an exemplary method of automatic demographics measurement "to determine the race and gender of the person in the images" in (Applicants' specification, page 8, lines 11-22), including "learning phase" and examples of demographic classifiers.

(2) Viola teaches a demographic analysis system. However, as the last O.A. noted, Viola does not teach using the demographic recognition to create a face model.

As a matter of fact, Viola clearly teaches away both from the methods in Rowe and from the novel ideas in the present invention.

Viola clearly emphasized that "The central contribution of this paper is a demographic classification scheme which is specifically designed to work in this real-time and real-world context. One key difference from previous work is the difficulty of the task, since faces are extracted from unconstrained video which can be of poor quality. Such faces are rarely completely frontal, are weakly aligned, and have extreme variations in lighting and image quality." (Viola, page 1, column 2, lines 1-6). Viola further noted that their system reports similar error rate as previous system for gender classification, but the strength of their system is processing the task in real-time. (Viola, page 1, column 2, lines 6-16).

Viola re-emphasized that "A key distinguishing aspect of our work is the ability to perform analysis on unaligned faces. We forgo alignment for two reasons, robustness and efficiency", "Alignment requires the automatic extraction of facial feature, a process which is not entirely robust in the presence of significant pose, lighting, and qualify variation", and "Alignment also requires significant time, since the features must first be found and then the face needs to be cropped, transformed, and resampled." (Viola, page 2, column 1, lines 4-14)

Therefore, these teachings of Viola explicitly and clearly show that Viola teaches away not only from the present invention but also from Rowe because Viola tries to find a method that performs analysis on unaligned face images and forgo alignment, while Rowe and the present invention teach approaches that improve the process with regard to the alignment for the face modeling.

(3) Selection of a face model specific to the demographic recognition of the person as an approximate face model, whereby calculation of affine coordinates using demographic

dependent constant can be facilitated by the chosen approximate face model, is foreign to Sengupta.

Sengupta explicitly teaches a usage of a "generic 3D face model" in (Sengupta, page 341, column 1, lines 40-41) rather than a face model specific to the demographic recognition. Sengupta is entirely foreign to the idea of selecting a face model specific to the demographic recognition of the person as an approximate face model.

Whereas applicants explicitly noted the selection of a face model specific to the demographic recognition of the person as an approximate face model in "For a given set of face images of the person, the race and gender is determined, and a face model, specific for that sub-class (for example, male-Caucasian is a subclass) is chosen as an approximate face model by the subsystem 205 in the exemplary embodiment shown in FIG. 2." in (Applicants' specification, page 9, lines 1-4 and page 5, lines 5-7). Applicants also discussed the calculation of affine coordinates using demographic dependent constant in (Applicants' specification, pages 10-13). The usage of the face model is also described in "For face modeling application, the Euclidean coordinate values of the template model's eyes, nose and mouth position are used, from which the Euclidean structure of the subject's face is generated."(Applicants' specification, page 13, lines 16-18).

(4) As the last O.A. noted, Rowe is silent on using affine coordinates.

Combination of demographic recognition with affine coordinate based mesh adjustment technique face modeling is foreign to Sengupta.

Sengupta does not explicitly teach the idea of combining demographic recognition with affine coordinate based mesh adjustment technique face modeling.

Furthermore, the combination of demographic recognition with affine coordinate based mesh adjustment technique face modeling in the present invention produces results that are useful over the prior arts. Sengupta is foreign to this.

For example, both applicants and Sengupta noted about a demographic dependent constant. Applicants noted, "Here, a4 is known and is a race and gender dependent constant." in (Applicants' specification, page 12, lines 11-12), and Sengupta noted, "Here, we assume that a4 is known (our conjecture at this point is that it is a race dependent constant)." in (Sengupta, page 341, column 2, lines 14-16).

However, since Sengupta is entirely foreign to the idea of selecting a face model specific to the demographic recognition of the person as an approximate face model, Sengupta is further foreign to the idea that the calculation of affine coordinates using demographic dependent constant can be facilitated by the chosen approximate face model specific to the demographic recognition.

Viola, Rowe, and Sengupta Do Not Contain Any Justification To Support The Combination, Much Less In The Manner Proposed

5. The novelty and unobviousness of the invention in claim 1 are discussed based on the 4 points over the prior arts above. Especially, applicants respectfully emphasize that the following limitations of the prior arts show that there is no justification to support the combination of the prior arts.

(1) Viola does not teach using the demographic recognition to create a face model. As a matter of fact, Viola clearly teaches away both from the methods in Rowe and from the novel ideas in the present invention with regard to the alignment of the face images. The approach that Viola repeatedly emphasizes as its strength teaches away from the novel approach in the present invention.

(2) Rowe does not explicitly teach a specific idea of automatic demographic classification as the present invention does. Rowe is silent on using affine coordinates.

(3) Sengupta is entirely foreign to the automatic demographics measurement. Sengupta explicitly teaches a usage of a "generic 3D face model" rather than a 'face model specific to the demographic recognition' as the present invention does.

Therefore, there is no logical reason to support the combination of Viola, Rowe, and Sengupta. Viola, Rowe, and Sengupta are not only lack of key features presented in the present invention but also they teach away from each other, which makes the combination further difficult, as discussed above. Therefore, the prior arts do not contain any justification to support the combination, much less in the manner proposed.

Furthermore, as one of the co-inventors of the present invention, Kuntal Sengupta respectfully notes that it is unobvious how to derive the novel and unobvious features from the previous work in "An affine coordinate based algorithm for reprojecting the human face for identification tasks" to the present invention. The same co-inventor notes that there is no logical explanation and connection that his previous work in the prior art (Sengupta) can be combined with the other prior arts to produce the same result as in the present invention, because the prior arts do not explicitly teach the novel and unobvious features in the present invention.

6. Regarding claim 16, claim 16 recites limitations that are similar and in the same scope of the invention as those in claim 1 above.

Therefore, applicants respectfully request reconsideration of the claim 16 for the same reasons as stated above with regard to claim 1.

The Dependent Claims Are a Fortiori Patentable Over Viola, Rowe, and Sengupta

7. Dependent claims 6 and 9-11 incorporate all the subject matter of claim 1 and add additional subject matter, which makes them a fortiori and independently patentable over the references.

Applicants amended the claims 6 and 9-11 as follows:

8. Regarding claim 6, claim 6 further adds, "a step of using affine lines and their slope adjustment, which is proportional to depth of the point, for model estimation."

Although Sengupta teaches the idea of using affine lines and their slope adjustment, which is proportional to depth of the point, for model estimation, Sengupta is entirely foreign to the idea of combining this with the selected approximate face model based on the demographic determination (Applicants' specification, page 9, lines 1-4, and page 5, lines 5-15).

Viola is entirely foreign to this.

As the last O.A. noted, Rowe is silent on using affine coordinates.

9. Regarding claim 9, claim 9 further adds, "a step of using the affine line properties for re-projecting a matched pair in two images to a third image, once four facial landmarks are located in all of the three images".

Although Sengupta teaches the idea of using the affine line properties for re-projecting a matched pair in two images to a third image, once four facial landmarks are located in all of the three images, Sengupta is entirely foreign to the idea of "(b) locating four landmarks on the face of the person based on the facial feature detection," in claim 1, which claim 9 depends on, at "The facial feature extraction stage" (Applicants' specification, page 11, lines 12-13). Applicants discussed an exemplary facial feature detection from images in (Applicants' specification, page 17, line 15 – page 18, line 10), and Sengupta is foreign to this.

Viola is entirely foreign to this.

As the last O.A. noted, Rowe is silent on using affine coordinates.

10. Regarding claim 10, claim 10 further adds, "a step of using a single view to crudely model the face based on gender and ethnicity and then use anthropometric measures for identification".

Since Sengupta does not explicitly teach a method for automatic demographics measurement, Sengupta is foreign to the application of the automatic demographics measurement to facilitate the usage of the anthropometric measures for identification.

Viola is entirely foreign to this.

As the last O.A. noted, Rowe is silent on using affine coordinates although Rowe teaches a model based on gender and ethnicity.

Claim 10 incorporates all the subject matter of claim 1, which includes the limitation of "(f) combining said demographic recognition with affine coordinate based mesh adjustment technique for said face modeling".

11. Regarding claim 11, claim 11 further adds, "a step of using multiple views to model the face in the image based on the combination of the demographics and the affine line properties and then use the anthropometric measures for identification purposes".

Since Sengupta does not explicitly teach a method for automatic demographics measurement and Sengupta is foreign to the idea of combining demographic recognition with affine coordinate based mesh adjustment technique face modeling, Sengupta is further foreign to the application of the automatic demographics measurement to facilitate the usage of the anthropometric measures for identification.

Viola is entirely foreign to this.

As the last O.A. noted, Rowe is silent on using affine coordinates although Rowe teaches a model based on gender and ethnicity.

12. Dependent claims 20 and 23-25 incorporate all the subject matter of claim 16 and add additional subject matter, which makes them a fortiori and independently patentable over the references.

Applicants amended the claims 17, 20-21, and 23-25 as follows:

13. The last O.A. rejected claim 17 under 35 U.S.C. 103(a) as being unpatentable over Mohamed et al., US 6,925,438 B2 (hereinafter Mohamed), "A Unified Learning Framework for Real Time Face Detection and Classification," Paul Viola, Gregory Shakhnarovich and Baback Moghaddam, (hereinafter Viola), Rowe et al., US 7,257,239, (hereinafter Rowe), "An affine coordinate based algorithm for reprojecting the human face for identification tasks" Kuntal Sengupta and Jun Ohya (hereinafter Sengupta) and further in view of Marshall, et al. 3,740,466 (hereinafter Marshall).

Applicants canceled claim 17.

14. Regarding claims 20, 23, 24, and 25, claims 20, 23, 24, and 25 recite limitations that are similar and in the same scope of invention as to those in claims 6, 9, 10, and 11, respectively, above. Therefore, applicants respectfully request reconsideration of the claims 20, 23, 24, and 25, for the same reasons as stated above with regard to claims 6, 9, 10, and 11, respectively.

15. Accordingly applicants submit that the dependent claims are a fortiori patentable and should also be allowed.

CONCLUSION

For all the above reasons, Applicants submit that the specification and claims are now in proper form, and that the claims all define patentably over the prior art. Therefore they submit that this application is in condition for allowance now, which action they respectfully solicit.

Conditional Request for Constructive Assistance

Applicants have amended the specification and claims of this application so that they are proper, definite, and define novel structure, which is also unobvious. If, for any reason this application is not believed to be in full condition for allowance, Applicants **very respectfully request** the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P. § 2173.02 and § 707.07(j) in order that the undersigned can place this application in allowable condition.

Very respectfully,

Rajeev Sharma

Kuntal Sengupta 01/11/2010

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